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NOKIA

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June 16, 2000

Ms. Magalie Roman Salas
Office of the Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
12th Street Lobby, TW-A325
Washington, DC 20554

JUN 16 2000

Re: **Reply Comments in MM Docket No. 00-39**
Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television

Dear Ms. Salas:

Enclosed please find an original and four copies of Nokia's reply comments in response to the Commission's Notice of Proposed Rule Making in the above-captioned proceeding. Also enclosed is a duplicate copy to be date stamped and returned. If you should have any questions or need further information, please do not hesitate to contact me at (202) 887-5330.

Sincerely,

Leo R. Fitzsimon
Director, Regulatory and Industry Affairs
Nokia Inc.

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of	)	
	)	
Review of the Commission's Rules and	)	MM Docket No. 00-39
Policies Existing Affecting the Conversion	)	
To Digital Television	)	

Reply Comments of Nokia Inc.

Nokia Inc. ("Nokia"), pursuant to Section 1.415 of the Commission's Rules, 47 C.F.R. § 1.415 (1999), hereby files these reply comments in response to certain comments filed in response to the *Notice of Proposed Rule Making* ("*Notice*") in the above-captioned proceeding.[1] Nokia is pleased to provide its views on certain issues raised by the Commission in the *Notice* and discussed by several parties in their comments. In particular, Nokia provides its views on the issue of allowing broadcasters to operate using COFDM technology as an alternative modulation standard for DTV transmission.

I. Introduction

Nokia is the world's leading manufacturer of mobile phones and a leading manufacturer in mobile infrastructure equipment. In addition, Nokia Multimedia Terminals has been pioneering the technology behind digital television for many years, combining advanced access methods for user friendly and intelligent multimedia terminals. Nokia has a vision for the open platforms of digital television and is building value-added concepts for service providers all over the world.

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[1] *Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television*, MM Docket No. 00-39, Notice of Proposed Rule Making (rel. Mar. 8, 2000).

As part of this effort, Nokia is keenly interested in developments in the U.S. DTV market. Nokia believes that the transition to DTV in the U.S. holds great promise for broadcasters, equipment manufacturers, and most importantly, consumers, in the form of exciting new products and services. As a worldwide leader in digital television and one of the founders of the widely accepted Digital Video Broadcast (DVB) standard, Nokia wishes to share its views and experience with the Commission as it considers certain issues raised by commenters in this proceeding.

II. The Commission Should Allow Multiple Modulation Standards

Several commenters addressed the debate about the relative merits of different modulation technologies. Some of these commenters urged the Commission to carefully evaluate alternative modulation technologies and to consider the merits of allowing more than one modulation technology in the U.S. terrestrial DTV system.[2] Nokia agrees with these commenters and notes that generally, they did not urge the Commission to replace the current 8-VSB standard. In particular, Nokia agrees with the views of Microsoft on the issue of making a thorough evaluation of all available technologies:

> Moreover, there is no material risk in conducting a thorough evaluation of other technologies. Many of these technologies, such as COFDM, have already been widely tested and continue to be developed and improved. Conducting additional interference studies could be completed in under a year . . . Because COFDM could be added as a an option to 8-VSB rather than as a replacement, the Commission may wish to consider its possible adoption in addition to 8-VSB.
>
> This is an especially propitious time to address important technical issues because the transition to DTV remains in its early phase. Thus, to the extent that any change is required in the technology, there is not yet a

[2] Comments of Microsoft Corporation at 6-7; Comments of Sinclair Broadcast Group at 26; Comments of the Association of Local Television Stations, Inc (urging Commission to review COFDM in case problems with 8-VSB standard are not adequately resolved).

large installed base of potentially incompatible hardware that would require upgrading or replacement.[3]

The Commission's primary goal for the DTV transition must be what is best for consumers, in terms of the best technology and the best choice of services. After review of the record in this proceeding, Nokia is convinced that in order to achieve this paramount goal the Commission must reconsider the status quo in light of alternative technological developments that can result in increased services and benefits to consumers. As noted by several commenters,[4] the COFDM modulation standard is a robust, widely tested and deployed standard that is particularly suited for mobile and portable applications.[5] These applications will allow broadcasters to expand their offerings to provide new and innovative services and applications to consumers. Broadcasters who choose to offer these exciting new services should be afforded the opportunity to choose the technology best suited for these applications. While proponents of the status quo situation have noted that innovative applications such as mobile and portable uses are *possible* within the ATSC standard after a standardization process,[6] the record is replete with statements that COFDM is particularly well suited to allow broadcasters to provide such services.[7] Nokia urges the Commission to allow broadcasters that wish to offer these innovative services to do so by allowing them to use the COFDM modulation standard.

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3 Comments of Microsoft Corporation at 7.

4 *See* Comments of Microsoft Corporation at 6; Comments of Pappas Telecasting of Southern California at 5; Comments of Pegasus Communications Corporation at 4-5; Comments of Sinclair Broadcast Group at 28.

5 As noted above, Nokia has been a leader in the development of the DVB-T standard. As such, Nokia wishes to supplement the record of this proceeding by providing a brief technical description of the benefits of the DVB-T standard and the COFDM modulation method. This is contained in Attachment A hereto.

6 Comments of the Consumer Electronics Association at 21, Comments of Zenith Electronics Corporation at 9.

III. Conclusion

Nokia acknowledges support in the record for the coexistence of multiple modulation standards and concurs with several commenters that competition in the marketplace should be allowed to decide the most appropriate standard for certain applications. Such an approach is fully consistent with the Commission's policy in other areas of promoting technological neutrality and competition and letting the marketplace decide on the best standards. Consistent application of this market-driven Commission policy to the DTV transition will ultimately result in the widest range of technologies, more options for consumers and greater flexibility for broadcasters.

Respectfully Submitted,

Nokia Inc.

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[7] *Supra* note 4.

ATTACHMENT A

TECHNICAL FACTS ABOUT THE DVB-T SYSTEM

1. General

The DVB-T standard was developed by the DVB project for terrestrial broadcasting. It is a member of a family of standards intended for various distribution channels like satellite, cable, LMDS etc.

The system was designed to operate within the existing UHF spectrum allocation for analog transmissions and can be used with 6, 7 or 8 MHz channel bandwidths depending on the regional demands. Operations on the VHF band are also possible.

2. Modes

The DVB-T standard has built in flexibility for different operating conditions. 2 FFT sizes (8k and 2k) are available as well as several inner modulation schemes, 5 different code rates and 4 different guard intervals. Together these parameters can be used to select the right mode for a specific need. Bit rates range from 4.98 Mbit/s(8 MHz) or 3.732 Mbit/s (6 MHz) to 31.67 Mbit/s (8 Mhz) or 23.751 Mbit/s (6 MHz), depending on the choice of channel coding parameters.

3. Multipath and echoes

The DVB-T system was designed to cope with severe multipath propagation. Therefore it is capable of coping not only with Gaussian channel, but also with Ricean (fixed) and Rayleigh (portable) channels. It can withstand high-level (up to 0 dB), long delay echoes which makes it possible to use the spectrum efficient SFN for broadcast networks. It can also cope with dynamic multipath distortion, which makes it possible to set up mobile services. It therefore works without a problem in dynamic ghost channels, associated with indoor reception.

4. Hierarchical modes

DVB-T also includes several hierarchical modes, which can transfer two separate bit streams simultaneously, with different robustness. Therefore the DVB-T offers an efficient way of combining HDTV and SDTV transmissions or otherwise classifying the services according the required quality of service or service area.

5. Mobility

Although DVB-T was not initially designed for mobile services, it actually can offer a wide range of possibilities for mobile use. Tolerance to Doppler shift is very good in general and excellent in some modes. The actual achievable speeds depend on the mode selected and the frequency used. Even the 8k 64 QAM high capacity mode can tolerate speeds up to about 50 km/h (30 mph). If a suitable mobile mode like 8k or 2k 16QAM is selected the maximum speeds are in the range of 100 km/h (60 mph) to more than 200 km/h (120 mph). With the most robust 2k QPSK mode speeds even higher than 400 km/h (250 mph) are possible. It should also be noted that these results are achieved with more or less standard open market receivers, without any special features developed for mobile use. With advanced receivers, performance can be even better.

6. SFN

As the DVB-T system is robust to interference from delayed signals, which can be either echoes of terrain or building reflection, or signals from distant transmitters operating at the same frequency, it is possible to build Single Frequency Networks (SFN). The concept of SFN is efficient in saving the spectrum required to offer a service to a certain geographical area. By having both 2k and 8k modes as well as several guard intervals, the DVB-T system can offer efficient tools for planning SFNs for various purposes including mobile networks.

One benefit of the SFN principle of DVB-T also in MFN type of networks, is the possibility to enhance the receiving conditions locally with cheap gap fillers and repeaters using the same frequency. These are basically simple selective amplifiers, which will reradiate the original signal and offer better field strength to difficult locations. Using gap fillers, portable and mobile reception possibilities are even better. These can also replace local in-house distribution cables.

7. Receiver technology

DVB-T receiver technology is well established. There are at least 6 to 12 silicon vendors around the world offering COFDM demodulator ASICs in volume. In general the demodulator technology used is already in the second generation and third generation will be available in 2001. The required RF-technology is rather simple, no special high cost solutions are required. For example the long discussed phase noise level of the oscillators has been no problem at all. The required levels are reached without any extra cost, just by doing proper design. Field experience from UK (2k) and Sweden (8k) have shown that the technology overall is mature.